

REMARKS

Claims 1 and 3-33 were pending on the mailing date of the outstanding Office Action (31 October 2006). Claims 1, 19 and 22-29 have been amended without prejudice to pursuing the subject matter of the claims without the foregoing amendments, and/or in other forms in a continuation application. The applicants expressly do not disclaim the amended subject matter. Therefore, claims 1 and 3-33 are presently pending in the application.

All of the previously pending claims were cancelled in the Office Action dated 31 October 2006. More specifically, the claims were rejected on the following grounds:

(A) Claims 1, 3-16 and 18-29 were rejected under 35 U.S.C. § 102 over U.S. Publication No. 2001/0032788 (Woodruff);

(B) Claims 1, 3-10, 15, 16, 19-22 and 24-29 were rejected under 35 U.S.C. § 102 over U.S. Patent No. 5,883,762 (Calhoun);

(C) Claims 17 and 30-33 were rejected under 35 U.S.C. § 103 over Woodruff;

(D) Claims 17, 18, 23 and 30-33 were rejected under 35 U.S.C. § 103 over Calhoun;

(E) Claim 11 was rejected under 35 U.S.C. § 103 over the combination of Calhoun and Japanese Patent No. JP 59-150094 (Inagaki);

(F) Claim 12 was rejected under 35 U.S.C. § 103 over the combination of Calhoun, Inagaki and U.S. Patent No. 6,391,166 (Wang);

(G) Claim 13 was rejected under 35 U.S.C. § 103 over the combination of Calhoun and U.S. Patent No. 5,256,274 (Poris);

(H) Claim 14 was rejected under 35 U.S.C. § 103 over the combination of Calhoun and U.S. Patent No. 6,126,798 (Reid); and

(I) Claims 1 and 3-33 were rejected under the doctrine of obviousness-type double patenting over (1) claims 1-35 of pending U.S. Application No. 10/729,357 and (2) claims 2-12, 22-29, 48-51, 54-56 and 65 of U.S. Application No. 09/872,151.

As a preliminary matter, the applicants do not accede to the interpretations of claims 1, 8-10, 23, 24, 26, 27, 29, 32 and 33 set forth in paragraphs 2-3 of the Office Action. The applicants expressly traverse the application of MPEP § 2115 to the positive claim limitations related to the composition of the electrolytes in combination with the other structural features of the electrochemical deposition chambers.

A. Response to Section 102 Rejection – Woodruff

Claims 1, 3-16 and 18-29 were rejected under Section 102 over Woodruff. Claims 1, 19, 23, 24 and 27 are the independent claims subject to this rejection. The following remarks address claims 1, 3-16, 18 and 23 as a first group, claims 19-22 as a second group, and claims 24-29 as a third group. Additionally, the discussion of Woodruff herein addresses the relevant embodiments disclosed in the specification and figures of Woodruff; in no way is the following discussion of Woodruff a characterization or interpretation of the claims or scope of Woodruff. The claims in Woodruff, moreover, are expressly not limited to the embodiments disclosed in the specification of Woodruff. Therefore, the claims in Woodruff are to be interpreted without reference to this paper.

1. Claims 1 and 23

Claim 1 is directed toward an electrochemical deposition chamber for depositing material onto microfeature workpieces that includes a processing unit having a first flow system configured to convey a flow of a first processing fluid to a microfeature workpiece, and a barrier unit detachably mounted to the processing unit such that the barrier unit is below the processing unit. The chamber further includes an electrode unit coupled to the

barrier unit such that the electrode unit is below the barrier unit. The electrode unit includes an electrode and a second flow system configured to convey a flow of the second processing fluid at least proximate to the electrode. The system further includes a nonporous barrier at the barrier unit to separate the first and second processing fluids. A nonporous barrier comprises a material that allows either cations or anions to pass through the barrier between the first and second processing fluids.

Claim 1 is patentable over Woodruff under Section 102 because this reference fails to disclose or suggest several features of claim 1. Woodruff, for example, does not disclose or suggest an electrochemical deposition chamber having a processing unit, a barrier unit detachably mounted to the processing unit such that the barrier unit is below the processing unit, and an electrode unit releasably coupled to the barrier unit such that the electrode unit is below the barrier unit and spaced apart from the processing unit. Claim 1 is accordingly patentable over Woodruff under Section 102. Claim 1 is also patentable over Woodruff under Section 103 because this combination of features provides an improvement in implementing a barrier in an electrochemical deposition chamber.

Claims 3-16 are patentable over Woodruff under Sections 102 and 103 as depending from patentable independent claim 1, and also because of the additional features set forth in claims 3-16. Independent claim 23 includes features at least partially analogous to those described above with respect to claim 1, and thus claim 23 is also patentable over Woodruff. The applicants, therefore, respectfully request withdrawal of the rejection of claims 1, 3-16 and 23 under Section 102 over Woodruff.

2. Claim 19

Claim 19 is directed toward an electrochemical deposition chamber that comprises a head assembly and a vessel. The head assembly includes a workpiece holder configured to position a microfeature workpiece at a processing site and a plurality of electrical contacts arranged to provide electrical current to a layer on the workpiece. The vessel includes a processing unit for carrying one of a catholyte and an anolyte proximate

to the workpiece, an electrode unit having a plurality of electrodes, and an upper portion canted at an angle relative to the processing unit, and a semipermeable barrier between the processing unit and the electrode unit. The semipermeable barrier selectively inhibits one of anions and cations from passing between the catholyte and the anolyte, and the semipermeable barrier is canted at the angle of the upper portion of the electrode unit. The upper portion of the electrode unit and the semipermeable barrier are accordingly at an angular deviation from a vertical or horizontal plane such that they are slanted or obliquely oriented from vertical and horizontal planes.

By canting both the upper portion of the electrode unit and the semipermeable barrier, bubbles trapped under the barrier can migrate to a vent to avoid creating dielectric areas on the barrier. Additionally, this feature also can be used in some embodiments to uniformly space the electrodes from the barrier. This feature is useful in applications in which the second processing fluid has low acid concentrations because such processing fluids are less conductive. As a result, a difference in the distance between the barrier and separate sections of an individual electrode or between different electrodes can have a greater effect on the electrical field at the workpiece than a difference in the distance between the workpiece and the barrier.

Claim 19 is patentable over Woodruff under Section 102 because Woodruff fails to disclose or suggest at least the combination of an electrode unit having a canted upper portion and a canted semipermeable barrier between the processing unit and the electrode unit. Claim 19, therefore, is patentable over Woodruff.

Claims 20-22 are patentable over Woodruff as depending from claim 19 and also because of the additional features of these claims. The applicants accordingly request withdrawal of the rejection of claims 19-22 over Woodruff under Section 102.

3. Claims 24 and 27

Claims 24 and 27 are directed towards systems for wet chemical processing of microfeature workpieces. Claim 24, more specifically, is directed toward a system that comprises a first processing fluid having a concentration of between approximately 10 g/l and approximately 200 g/l of acid, a processing unit carrying the first processing fluid and being configured to provide the first processing fluid to a microfeature workpiece, and a second processing fluid having a concentration of between approximately 0.1 g/l and approximately 1.0 g/l of acid. The system further includes an electrode unit carrying the second processing fluid, an electrode, and a semipermeable barrier between the processing unit and the electrode unit. The semipermeable barrier is to separate the first and second processing fluids. Claim 27 is similar to claim 24, but the acid concentrations of the first and second processing fluids is expressed as a ratio instead of a specific concentration.

The first and second processing fluids of claims 24 and 27 are positive elements that constitute structural features of the system. Notably, to infringe claims 24 or 27, a system must include the claimed first and second processing fluids, or an equivalent thereof, in combination with the processing unit, the electrode unit and the nonporous barrier. Moreover, the claimed first and second processing fluids should be given patentable weight because the different acid concentrations in the first and second processing solutions are used to control the concentration of the constituents in the first processing fluid within a desired range to insure consistent and uniform deposition on the workpiece (paragraph [0043]). Referring to Figures 3A-3H of the present application, the concentration of acid in the first processing fluid is greater than the concentration of acid in the second processing fluid, and the volume of the first processing fluid in the system is greater than the volume of the second processing fluid in the system. As a result, the first processing solution is replenished with copper ions or other types of metal ions during an idle state because the different acid concentration of the first processing solution and the second processing solution drives the metal ions across the barrier. This enables the

desired concentration of the metal to be maintained in the first processing solution, while also preventing saturation of the metal in the second processing solution. This combination of features accordingly provides a distinct improvement.

The Examiner asserts that acid concentrations in the first and second processing solutions are not patentable features under MPEP § 2115. The applicants respectfully disagree with this finding because MPEP § 2115 is directed toward claims that include the article under treatment as a limiting feature. This is not the case in claims 24 or 27 because the article under treatment is the microelectronic workpiece, whereas the first and second processing solutions are claimed elements of the systems. Therefore, the applicants respectfully request that the claimed first and second processing solutions be given patentable weight in consideration of claims 24 and 27.

Claims 24 and 27 are accordingly patentable over Woodruff under Section 102 at least for the reason that Woodruff does not disclose or suggest an electrochemical deposition system having a first processing fluid and a second processing fluid with the claimed acid concentrations (claim 24) or the claimed ratio of acid concentrations (claim 27). Claims 25, 26, 28 and 29 depend from either claim 24 or claim 27, and therefore, these claims are patentable over Woodruff for analogous reasons and also because of the additional features of these claims. The applicants respectfully request withdrawal of the rejection of claims 24-29 over Woodruff.

B. Response to Section 102 Rejection – Calhoun

Claims 1, 3-10, 15, 16, 19-22 and 24-29 were rejected under Section 102 over Calhoun. The applicants respectfully submit that independent claims 1, 19, 24 and 27 are patentable over Calhoun for the reasons explained above with respect to Woodruff. The applicants accordingly request withdrawal of the rejection of claims 1, 3-10, 15, 16, 19-22 and 24-29.

C. Response to Section 103 Rejection – Woodruff

Claims 17 and 30-33 were rejected under 35 U.S.C. § 103 over Woodruff. Claim 17 depends from claim 1, and therefore the applicants submit that claim 17 is patentable over Woodruff under Section 103 for at least reasons explained above with respect to claim 1, and also for reasons analogous to those explained below with respect to claim 30.

In response to the rejection of claims 30-33, claim 30 is directed toward a system for wet chemical processing of microfeature workpieces. The system comprises a processing unit for providing a first electrolyte to a microfeature workpiece, a first reservoir in fluid communication with the processing unit, an electrode unit for carrying a second electrolyte and having an electrode proximate to the second electrolyte, and a second reservoir in fluid communication with the electrode unit. The first reservoir and the processing unit are configured to carry a first volume of the first electrolyte. The second reservoir and the electrode unit are configured to carry a second volume of the second electrolyte such that the first volume of the first electrolyte is at least twice the second volume of the second electrolyte. The system further comprises a semipermeable barrier between the processing unit and the electrode unit to separate the second electrolyte and the first electrolyte while permitting ions to pass between the second electrolyte and the first electrolyte. As explained in the specification with respect to Figures 3A-3H, the volume difference between the first and second electrolytes works in combination with the acid concentrations of the first and second electrolytes to maintain the desired concentration of constituents in the first electrolyte. More specifically, by providing a significantly larger volume for the first electrolyte, the relative change in concentration in the electrolytes can be vastly different such that the difference in the concentrations can cause the metal ions to pass across the barrier in a desired direction during an idle state.

Claim 30 is patentable over Woodruff because providing a system in which the total volume of the first electrolyte is at least twice the total volume of the second electrolyte is not an obvious design choice. More specifically, when a barrier is used to separate an

anolyte and a catholyte, the anode cannot inherently replenish the metal ions in the first processing fluid that acts on the workpiece. Many previous systems overcame this problem by adding metal ions to the first electrolyte from a separate ion source. The present inventors recognized this problem and solved it in a different manner by increasing the volume of the first electrolyte relative to the second electrolyte such that the chemical properties of the first and second electrolytes cause metal ions to move across the barrier in a manner that automatically replenishes the first electrolyte during an idle state. The design solves a specific problem in a different manner than the prior art. Moreover, the claimed system limits other design criteria because tools are generally designed by balancing many different criteria, and thus enlarging one reservoir to meet the claimed features may limit the flexibility in designing other aspects of the tool. Claim 30, therefore, is patentable over Woodruff under Section 103.

Claims 31-33 are patentable over Woodruff as depending from independent claim 30 and also because of the additional features of these dependent claims. The applicants, therefore, respectfully request withdrawal of the rejection of claims 17 and 30-33 over Woodruff under Section 103.

D. Response to Section 103 Rejection – Calhoun

Claims 17, 18, 23 and 30-33 were rejected under Section 103 over Calhoun. The applicants respectfully submit that claim 17, 18, 23 and 30-33 are patentable over Calhoun for reasons analogous to those explained above with respect to the Section 102 and Section 103 rejections over Woodruff.

E. Response to Section 103 Rejection – Calhoun and Inagaki

Claim 11 was rejected under 35 U.S.C. § 103 over the combination of Calhoun and Inagaki. Claim 11 depends from claim 1, and thus it is patentable over Calhoun alone for the reasons explained above. Inagaki fails to disclose or suggest any features that

overcome the shortcomings of Calhoun. Therefore, claim 11 is patentable over the combination of Calhoun and Inagaki.

F. Response to Section 103 Rejection – Calhoun, Inagaki and Wang

Claim 12 was rejected under 35 U.S.C. § 103 over the combination of Calhoun, Inagaki and Wang. Claim 12 ultimately depends from claim 1, and therefore it is patentable over the combination of Calhoun and Inagaki as explained above with respect to claim 11. Wang fails to overcome the shortcomings of Calhoun and Inagaki. Claim 12 is accordingly patentable over the combination of Calhoun, Inagaki and Wang.

G. Response to Section 103 Rejection – Calhoun and Poris

Claim 13 was rejected over the combination of Calhoun and Poris. Claim 13 depends from claim 1, and thus it is patentable over Calhoun alone under Section 103. Poris fails to disclose or suggest subject matter that would overcome the shortcomings of Calhoun. Therefore, claim 13 is patentable over the combination of Calhoun and Poris.

H. Response to Section 103 Rejection – Calhoun and Reid

Claim 14 was rejected under 35 U.S.C. § 103 over the combination of Calhoun and Reid. Claim 14 depends from claim 1, and thus it is patentable over Calhoun alone under Section 103 for the reasons explained above. Reid fails to overcome the shortcomings of Calhoun, and therefore claim 14 is patentable over the combination of Calhoun and Reid.

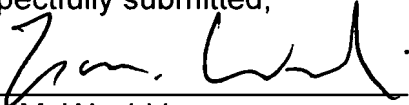
I. Response to Obviousness-Type Double Patenting Rejection

Claims 1 and 3-33 were rejected under the doctrine of obviousness-type double patenting over (1) claims 1-35 of U.S. Application No. 10/729,357 and (2) claims 2-12, 22-29, 48-51, 54-56 and 65 of U.S. Application No. 09/872,151. Without conceding the merits of these double patenting rejections, Terminal Disclaimers with respect to the '357 Application and the '151 Application are enclosed. Therefore, the applicants respectfully submit that the obviousness-type double patenting rejections are now moot.

In light of the foregoing, the pending claims comply with 35 U.S.C. § 112 and are patentable over the cited art. The applicants request reconsideration of the application and respectfully submit that the claims are in condition for allowance. If the Examiner has any questions or believes a teleconference would further expedite prosecution in the application, he is encouraged to contact Paul Parker at 206.359.3258.

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Respectfully submitted,

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